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The Relations Among Perceived Similarity, Familiarity, and Beliefs about Reality

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The Relations Among Perceived Similarity, Familiarity, and Beliefs About Reality

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Abstract

The Relations Among Perceived Similarity, Familiarity, and Beliefs about Reality

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The first goal of this study is to test the prediction that children who perceive similarity between a novel physical event and the real world will be more likely to express belief in the reality of a novel character involved in the event than children who do not perceive such similarity. The second goal is to test the effects of familiarity on similarity judgements, reality status beliefs, and their association. In this study, children ages 4 and 6 years were visited 5 times and were repeatedly told about a novel character performing either a highly similar, moderately dissimilar, or a highly dissimilar physical event. Their similarity judgements and reality status judgements were solicited on days 1 and 5. Results revealed high rates of association between similarity and reality status beliefs for the highly similar and moderately dissimilar events but low levels of association for the highly dissimilar event on day 1. With repeated exposure, children's positive similarity judgements increased for the highly dissimilar event leading to higher rates of association.

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The Relations Among Perceived Similarity, Familiarity, and Beliefs About Reality

As humans, we possess the ability to create and perpetuate narratives for our own pleasure and for the purpose of sharing them with others. Narratives can either tell us some truth about our world or can tell a captivating story without holding any fundamental truth relation to our world. The ancient Greeks told stories about mythical creatures whom they believed were responsible for maintaining world order. The age of enlightenment brought about literary works advocating the use of reason as the source of true knowledge and morality. Conversely, Douglas Adams' *The Hitchhiker's Guide to the Galaxy* is a window into a novel fictional world. With such an expansive source of narratives, how do we decide which to take as truth and which to enjoy as a work of fiction, and how does this ability develop?

One view of development holds that children are unequipped to differentiate reality and non-reality. Perhaps adults but not children possess a sharp division between what is real and what is not real (Skolnick and Bloom, 2006). In line with this view, researchers have documented children's belief in fantastical entities like monsters and dragons (Sharon and Woolley, 2004) as well as in culturally endorsed entities like the Easter Bunny and Santa Claus (Clark, 1995; Sharon and Woolley, 2004). In one study, Sharon and Woolley (2004) asked children between the ages of 3- and 5-years to identify the reality status of a number of different characters, some real and some fictional. Their results indicated that, with age, children get increasingly better at correctly identifying real characters, while appreciation for the fictional nature of non-real characters comes later in development. Thus, although children become increasingly aware that certain

beings are real, they remain inclined to believe that many fictional beings are real, especially those fostered by their parents and social surroundings.

More recently, however, researchers have documented many nuances in children's beliefs about reality. Although there are some instances in which children seem to readily accept novel information, there is also much evidence that reveals their strong analytical nature. In one study, Chandler and Lalonde (1994) demonstrated that children have theories and expectations about how the world works, such that when they are presented with a seemingly impossible event, they actively explore their environment for cues to identify the mechanism responsible for the event. In their study, children between the ages of 3-and 4-years were shown the traditional Baillargeon box (e.g., Baillargeon, 1987) which appears to defy a fundamental law of physics. Surprised at the outcome, these children explored the apparatus until they identified the trap door responsible for the illusion. Further evidence of children's incredulity comes from a study by Woolley and Cox (2007) exploring children's understanding of storybook reality. In their study, the researchers read a number of stories to children between the ages of 3- and 5-years, and asked them a series of questions regarding the possibility of the story's events and the nature of the characters. The researchers found that even the youngest of their participants differentially judged the possibility of the events according to the type of story they heard. Specifically, children who heard fantastical stories judged that the events could not occur in reality, whereas children who heard realistic stories were more likely to claim that the events could occur in real life. Such work has challenged the traditional view of children as faith-filled, fantasy-prone beings and credited these youngsters with a richer, more adult-like construal of reality.

A similar inconsistency exists in the literature on adults' conception of reality. While some researchers have demonstrated that adults discriminate between improbable,

yet possible, events and impossible, law defying events (Shtulman, 2007), recent reports have documented that adults also endorse and express belief in supernatural forces (Subbotsky, 2004). For example, a recent Gallup poll (2007) surveyed over 1000 adults regarding their belief in God, the Devil, and other supernatural entities. Results from their nationwide survey reported that 86% of American adults believe in God, 69% confess to believing in the Devil, and 75% claim they believe in angels. Pepitone and Saffioti (1997) have found that adults endorse supernatural forces and entities, including luck, fate, and God, to explain some of life's unexpected and puzzling events. Furthermore, Gray and Wegner (2010) have demonstrated that adults blame God for people's suffering, particularly when no other agent is available to take the blame. Belief in such supernatural entities raises questions of whether adults do indeed have a strict distinction between reality and non-reality.

In light of this variation in belief, to say that adults, but not children, have a "sharp division between what is real and what is not" (Skolnick & Bloom, 2006a, p. 73) seems misleading. Not only does it seem incorrect to assert that children lack this division, it also seems misleading to declare that adults possess it. In an empirical study, Skolnick and Bloom (2006b) investigated children and adults' understanding of fiction, specifically fictional narratives. They tested the hypothesis that children, unlike adults, create one fictional world which encompasses all fictional stories they have encountered, and distinguish it from one real world which encompasses all their real world knowledge. To test this hypothesis, the researchers asked the participants to judge the nature of various relationships shared between 1) themselves and a real person (e.g., their mother), 2) themselves and a fictional character 3) two fictional characters from different worlds (e.g., SpongeBob and Batman) and 4) between fictional characters of the same world (e.g., Batman and Robin). Their predictions explained that if children create one all

encompassing fictional world, then they would state that all fictional characters are real to each other. For example, children would state that SpongeBob and Batman are real to one another, therefore implying that these two characters are part of the same world.

Their results revealed not only that children separate real worlds from fictional worlds but also that children, like adults, distinguish fictional worlds from each other. They found that both children and adults separate the world of Batman from that of SpongeBob insofar as they agree that Batman is fictional to SpongeBob but not to Robin. Thus, it appears that children and adults construct fictional worlds similarly, insofar as they both separate characters into different fictional worlds, rather than creating one dichotomy of real versus fiction.

DEFINING A FICTIONAL WORLD

According to Skolnick and Bloom (2006a), fictional worlds are judged as such in virtue of their dissimilarity to our world. In the present paper, I extend this view to propose that this to applies not only to fictional worlds, but to all novel worlds we encounter. For example, upon first hearing about the world of Harry Potter, we might evaluate it as dissimilar to our actual world and conclude that it is fictional. Likewise, upon first hearing about the world of the Brazilian Satere-Mawe tribes (where a rite of passage to manhood involves enduring ten minutes of direct stings by bullet ants; Haddad, Cardosa, and Moraes, 2005), we might evaluate it as dissimilar to our actual world and mistakenly conclude that it is fictional. Such realities are what I refer to as dissimilar real worlds, and they are presented to us quite frequently, for example in historical accounts, in reading about novel inventions, and even as we contemplate the future. Arthur C. Clarke's third law holds that "any sufficiently advanced technology is

indistinguishable from magic" (Clarke, 1962). Indeed, the ideas that one could communicate with others at anytime without having to see them or be near them, and that one could build heavier-than-air flying machines were once deemed impossible. Is it possible, then, to correctly categorize all novel worlds upon the first encounter and is this a skill that changes with age?

I argue that we have no a priori way of determining the true reality status of a novel world. Rather, we make judgements based on similarity evaluations. I consider similarity evaluations to be the underlying mechanism that guides one's judgements about what is factual and what is fictional. To elaborate, I contend that all novel worlds, whether real or not, lie on a continuum of degrees of similarity to our own view of the real world. There is no objective split demarcating what we consider reality and non-reality - rather, each individual draws the line in accordance with his/her conception of what is similar to the actual world. The obvious question that follows is: What makes a world more similar to ours?

One strategy we can employ in assessing similarity is to evaluate the degree to which the novel world adheres to our theories about the laws of nature. Upon encountering a novel world, we evaluate the degree of discrepancy between the laws that govern our world and those that govern the novel world. Johnson and Harris (1994) document the sophisticated knowledge that 3- and 4-year-olds display when differentiating an event consistent with our physical laws from an event inconsistent with our physical laws. In their study, children were asked to identify which of a pair of events could be attributed to an ordinary child and which could be attributed to a magic fairy. By age three, children in their study seemed to display a strict distinction between ordinary and magical events. Furthermore, researchers have provided strong evidence that children appreciate the constraints of physical and biological laws on the events that can occur in

our world (e.g., Woolley and Cox, 2007; Rosengren, Kalish, Hickling, and Gelman, 1994). These studies provide support for the claim that expectations about the physical world can influence our judgements about reality status, making it a candidate for evaluating similarity. To illustrate the point, we can imagine that we have encountered, for the first time, a world where robots have consciousness. We might conclude that this is a fictional world, if and only if we consider this a violation of the physical laws in our world.

Indeed, research has confirmed that children as young as 4-years of age are able to reflect on the possibility of an event to infer the reality status of the event and the characters involved in it. In a recent study by Corriveau, Kim, Schwalen, and Harris (2009), children between the ages of 3- and 7- years were presented with a series of characters embedded into their own separate stories. Some characters were meant to be factual/historical in the sense that the stories contained no unexpected violations of real-world physical and causal laws. For example, children heard a story about a girl named Anne Paine from Washington D.C. who grew up to become a doctor. Other characters were intended to be fictional in that their stories involved events that are stark violations of physical laws. For example, children heard a story about a girl named Sarah Adams who owned a magic blanket that kept her safe and made her invisible. In these examples, correct responses would place Anne Paine into the category of real characters and Sarah Adams into the category of fictional characters. The researchers also included familiar characters in their experiment, including, but not limited to, a factual/historical story about George Washington and a fictional story about Snow White. Their results indicated that children of all ages were able to correctly categorize the familiar characters, but only the older children - 5- to 7-year-olds - correctly distinguished the novel characters. Moreover, children's explanations indicated that only the older children made inferences

based on the (im)possibility of the story's events. Still, the researchers were interested in probing this age difference to identify whether younger children are in principle unable to make these inferences.

To investigate this possibility, Corriveau et al. (2009) presented children between the ages of 3- and 5- years with a series of novel characters similar to the ones described earlier. The researchers asked the children first to identify whether the events in the stories were possible in real life before judging the reality status of the characters. In this manipulation, the researchers found that even the youngest children (as young as 3 years) were able to correctly associate the possibility of the events with the reality status of the character. The researchers interpret these findings to mean that children learn to deploy this strategy to judge the nature of the story by the end of the preschool years, but that younger children are capable of making use of the strategy when prompted. Insofar as children are capable of making possibility judgements of certain events, we can expect that they will successfully determine the reality status of novel characters in many instances. However, as the researchers point out, this strategy can lead to faulty categorizations (such as in cases of realistic fiction).

The strategy just discussed involves ascertaining the (im)possibility of a story's events to guide one's judgements about its factuality. However, not all fictional stories contain fantastical elements, nor do historical/factual stories always seem entirely ordinary. It follows, then, that evaluating the possibility of events is not a fail-proof thought process for deciding which stories are meant to report facts about the real world and which are meant to provide a fictional narrative.

A second possible criterion for categorizing worlds as similar or dissimilar relates to the degree of compliance with our social norms and expectations of appropriate normative behavior. Research suggests that children make judgements about possibility

based on how well an event fits into their existing social schemes. In a study by Kalish (1998), 3- and 4-year-olds were told stories about children who wanted to perform different kinds of actions and were asked to judge whether the actions could or could not be executed. Some stories depicted ordinary actions while others violated physical laws or social conventions. One story, for example, described a little boy who wanted to play in the snow with no clothes on. The results of the study indicated that children in both age groups were able to determine that some actions could be performed whereas others could not. However, the researchers found that these young children tended to exaggerate the constraints on actions that violated social conventions such that these actions, like those that violated physical rules, were considered not permissible. Similarly, Shtulman and Carey (2007) and Browne and Woolley (2004) have reported that young children consider improbable events, which typically violate social convention, as impossible in our world, whereas older children and adults do not consider violations of social norms an indication that an event is impossible in our world. For example, young children who hear about a world where people eat pickle-flavored ice cream might evaluate this as dissimilar to their conception of appropriate social behavior, and therefore conclude that the world is fictional. Older children might hear about the same event but consider this sufficiently similar to the actual world and therefore conclude that this is factual. Together, the data and the examples suggest that conformity to our social rules plays an important role in guiding our similarity judgements and subsequently our reality status beliefs.

Finally, one might stipulate that the perceptual appearance of a novel world might factor into our beliefs about its similarity to our world. On the one hand, cartoons or storybooks might set themselves apart from the real world by virtue of their appearances. For example, Dexter's world (of Dexter's Laboratory) might be quarantined as fictional

simply because it looks unlike our world. Alternatively, advances in computer animation technology have been credited for their highly realistic depictions of fictional worlds such as director Peter Jackson's vision of Middle-Earth from J. R. R. *Tolkien's Lord of the Rings*.

CHANGES IN BELIEF OVER TIME

These three factors - physical law, social convention, and perceptual similarity - present a coherent and plausible method for evaluating the similarity of a novel world to our own. No single factor determines the overall perceived similarity - rather, they are all components of the similarity evaluation. This framework explains why people can come to different conclusions about the reality status of a novel world, insofar as each judgement is consistent with each individual's own world view. The hypothesis, then, is that whether a novel world is categorized as real or fictional is a function of its similarity to one's worldview. In the context of the present study, only similarity of physical events (hereby referred to as physical law similarity and to be distinguished from similarity in appearance, which is referred to as perceptual similarity) is manipulated but results will provide motivation for a second study looking at the effects of social and perceptual similarity.

The view explained so far posits that each individual creates a continuum of worlds varying in their degree of similarity to the actual world. Worlds that are sufficiently similar to one's world, based on the factors explained above, are categorized as real, and are to be distinguished from worlds which are not similar to our world and thus categorized as not real. However, the position of each world on this continuum clearly changes over time. We see this, for example, in children's decreasing belief in magic with age (Phelps & Woolley, 1994). Moreover, beliefs can also increase over time.

Consider, for example, the centuries that passed before the belief that atoms are the smallest unit of all matter became widely accepted. How, though, do our beliefs change over time?

A fourth factor is suggested to explain changes in beliefs about reality status over time. It is proposed that familiarity with a novel world increases its perceived similarity to our world. Such familiarity is proposed to be a direct result of exposure, such that the more we are exposed to a narrative, the more familiar it becomes. This increased familiarity subsequently increases our sense of similarity, independently of the three factors previously discussed. Previous literature on the effects of familiarity on beliefs about attractiveness and perceived similarity provides support for this relationship. In a study by Moreland and Zajonc (1982), the researchers explored the relationship between repeated exposure and ratings of attractiveness and similarity to oneself. They manipulated the number of exposures their participants had to a person's face and recorded 1) participants' ratings of perceived similarity of the person to oneself and 2) ratings of attractiveness. Their results suggested a strong relationship between familiarity and similarity, such that repeated exposure predicted increased ratings of similarity to oneself as well as increased ratings of attractiveness. Conversely, perceived familiarity also increased with a higher degree of similarity. This literature supports the hypothesis that there is an intimate relationship between familiarity with novel characters and subsequent similarity judgements.

Further support for this hypothesis can be found in recent research documenting the neurological relationship between representations of familiar characters and real characters. Abraham and von Cramon (2009) have used functional magnetic resonance imaging techniques to illustrate that activation of the anterior medial prefrontal cortex and the posterior cingulate cortex (areas responsible for autobiographical memory and

self referential processes) is triggered when participants are asked to think about real characters but not fictional characters, and also when looking at familiar faces but not unfamiliar faces. Such evidence further motivates the prediction that familiarity has some effect on our reality status beliefs.

There are two conceivable changes that might occur with increasing familiarity. On the one hand, it is possible that familiarity will bring about corrective changes. For example, a previously held false belief about the non-reality of a character may become a true belief about the reality of its existence. Alternatively, familiarity can lead to erroneous changes, in cases where true beliefs become false beliefs. For example, a highly familiar fictional character could come to be judged as real.

Thus, the purpose of this study is twofold. First, it is to assess the associations between perceived similarity and beliefs about reality status. It is predicted that children who perceive similarity between a novel physical event and the real world will be more likely to express belief in the reality of a novel character involved in the event than children who do not perceive similarity between the event and the real world. The second goal is to assess the effects of familiarity, via repeated exposure, on similarity judgements, reality status beliefs, and their association. It is predicted that repeated exposure will increase either beliefs about similarity or reality status in such a way that their association is strengthened. There are two possible ways this increase in association may occur. First, it may increase due to changes in children's perceptions of similarity. That is, events that were originally deemed dissimilar to the real world come to be viewed as similar, or vice versa. Second, associations may increase due to changing beliefs in the reality of the novel character. Although this study will only focus on physical events, predictions similarly apply to social events.

Method

Participants

Eighty-eight typically developing male and female children between the ages of 4- and 6- years were included in this study. Children were recruited through local preschools and elementary schools and were randomly assigned to one of three conditions: a highly similar condition (N = 30), a moderately dissimilar condition (N = 30), or a highly dissimilar condition (N = 28). These age groups were selected based on previous literature documenting developmental differences in children's judgements of possibility and reality in the context of social and physical violations. Corriveau et al. (2009) reported that older children, ages 5- to 7-years, are able to spontaneously reflect on the possibility of events in judging the reality status of novel characters. Shtulman and Carey (2007) found that children younger that 8 years show naive incredulity towards events that seem improbable. As such, these age groups are appropriate for exploring developmental differences in children's initial judgements about similarity and reality status and the changes in their association that occur with repeated exposure.

Materials

Three novel narratives were constructed such that they each included the same physical event, riding a bike. One narrative included an ordinary, highly similar event - riding a bike with two wheels. The second included a possible but moderately dissimilar event (i.e., an event that does not violate any physical laws, but is conceptually unlikely) - riding a bike with one wheel. The third included a highly dissimilar event (i.e., includes a violation of physical laws) - riding a bike with no wheels. (See appendix for narratives). Each narrative was accompanied by a photograph of a boy riding the

corresponding bike to ensure that children focused on the target event. The number of wheels notwithstanding, the three photos were essentially identical.

PROCEDURE

Children were visited at their schools and were interviewed individually in a quiet corner of the classroom or adjacent hallway. Participants were assigned to a single condition in which they heard one of the three vignettes once a day for five days. Children also saw a picture of the target event. After each reading session, children were asked a series of 4-5 forced choice questions (see Appendix for script).

DEPENDENT MEASURES

Similarity Judgements

On day 1, children were asked questions about the perceived similarity of the event and about the reality status of the character. First, children were asked explicitly to judge the similarity between the novel event and the real world. They were asked Q1) "Tell me, do people around you do things like ride a bike with ___ wheels in real life ?". Children who responded positively to this question were considered to believe that target event is similar to the real world. Children who responded negatively to this question, however, were offered a second opportunity to express their perceptions of similarity. This was done to avoid the possibility that some children might have difficulty abstracting away from the literal interpretation of this first question (Q1), namely whether people in their immediate experience ride the specific bike in the picture. Thus, the addition of a second, more explicit question about the similarity between the physical law in the narrative and reality was included. Specifically, they were asked Q2) "Do you think someone could ride a bike with __ wheels in real life?". If children responded positively to this follow up question, they were considered to believe that the novel event

is similar to the real world. Children who responded positively to Q1 were not asked Q2 because any affirmation that people do things like ride the type of bike in question assumes or implies that people could ride such bikes. Children who responded negatively to both questions were considered as rejecting any similarity between the novel event and the real world.

Reality Judgements

After answering the similarity questions, children were asked two filler questions which were included to avoid association between the test questions and to lengthen the interview to a more natural length. The final question assessed children's beliefs about the reality status of the character. Specifically, they were asked Q3) "Is Mark a real boy or is he a pretend boy?"

As mentioned, the reading sessions were continued for 5 days, but only the first and final sessions were of interest for this study. The final session on day 5 followed the exact procedure as on day 1; all the same questions were asked. This second iteration of judgements was meant to evaluate the second hypothesis, that familiarity influences the association between similarity judgements and reality status beliefs. On days 2-4, children heard the narrative but were then asked a set of 4-5 forced choice filler questions simply to minimize variability between each session. None of the questions from days 2-4 were included in the analyses.

Association Between Similarity and Reality Judgements

To test the hypothesized relation between similarity judgements and reality status beliefs, each individual child's response pattern was scored. There were four possible response patterns for any single interview (2 levels of similarity x 2 levels of reality status beliefs). Associations were counted when children said the novel event was similar

to their real world AND that the novel character was real and when children said the novel event was dissimilar to the real world AND that the novel character was not real. Dissociations were counted whenever a child said that the event was similar to the real world but that the character was fictional or when a child said that the event was dissimilar but the character was real. Again, these associations and dissociations were calculated for both time points to assess the familiarity hypothesis.

Results

Overview

Presentation of the analyses follows three steps. In the first step, descriptive statistics for children's similarity judgements across the three conditions are presented. The purpose of this was to determine whether the rates of positive similarity judgements varied in accordance with the intended variation between the three conditions. That is, were children's similarity judgements highest in the highly similar condition, followed by those in the moderately dissimilar condition, and lowest in the highly dissimilar condition? In the second step, descriptive statistics for children's reality judgements across the three conditions are presented. The purpose of this was to determine whether the rate of children's reality judgements mirrored the rates of similarity judgements within each condition. That is, were rates of REAL judgements highest among children in the highly similar condition, followed by those in the moderately dissimilar condition, and lowest among children in the highly dissimilar condition? In the third step, associations between similarity and reality judgements upon initial exposure (day 1) and after repeated exposure (day 5) are compared across the three conditions. The purpose of this was to assess associations within each individual's response pattern both upon initial exposure and after repeated exposure.

SCORING

Responses to the perceived similarity questions were coded as 1 if the child answered YES to either of the questions and as 0 otherwise. Thus, a child who said YES to Q1 received a 1, and was considered to agree to some similarity between the event and reality. They were not asked the second similarity question, as it was already implicit in their affirmation of the first. However, a child who said NO to Q1, received a 0 but was then asked Q2. A child who answered YES to Q2 received a 1, and was treated equivalently to a child who received a 1 from Q1, because both children agreed to some level of similarity. Conversely, a child who also said NO to Q2 was considered to be rejecting any similarity between the novel event and the real world. Responses to Q3 were coded as 1 if the child answered REAL and a 0 if the child answered NOT REAL. Children's responses were coded for their first and last interview sessions to allow for comparison across time.

SIMILARITY JUDGEMENTS

Children were asked to assess the similarity between a novel event and the real world. The three variations were intended to represent three different levels of similarity. It was presumed that riding a two wheeled bike is highly similar to events in the real world and is more similar than riding a bike with one wheel, which is moderately dissimilar to events in the real world. Moreover, both of these physical events were presumed to be more similar than riding a bike with no wheels. Thus, to assess whether children's initial similarity evaluations corresponded to the gradation that was intended, a count of total positive similarity responses given on day 1 was conducted for each condition. Table 1 reports that all 30 children in the highly similar condition confirmed that the event was similar to the real world. Specifically, 29 out of 30 children responded positively to Q1 and 1 child responded positively on Q2. Of the children in the

moderately dissimilar condition, 25 (out of 30) responded positively to the similarity questions, 3 of whom responded positively to Q1. Only 8 (out of 28) children in the highly dissimilar condition conferred similarity between the event and reality with only 1 child responding positively to Q1. Overall, this confirms that children conceptualized the similarity of the physical event in accordance with the intended manipulation.

REALITY JUDGEMENTS

Given the hypothesis that beliefs about similarity and reality status are associated, we would expect that responses to the reality status question would vary in accordance with the distribution of similarity judgements reported above. That is, children in the highly similar and moderately dissimilar condition would both report high rates of REAL judgements followed by children in the highly dissimilar condition. Table 1 reveals that 26 (out of 30) children in both the highly similar and moderately dissimilar conditions answered REAL to the reality status question compared to 18 (out of 28) children in the highly dissimilar condition. That is, children in the highly similar and moderately dissimilar conditions were equally likely to judge the novel character as real but were more likely than children in the highly dissimilar condition to do so. Although this pattern is only partially supportive of the prediction that children's beliefs in the reality of the character would decrease as similarity decreases, it nevertheless follows the correct direction.

ASSOCIATIONS BETWEEN SIMILARITY AND REALITY JUDGEMENTS

Initial Exposure

The primary analyses concerned the relationship between each child's perceived similarity responses and reality status judgements over time and across conditions. A mixed effect logistic regression was conducted to test the effect of age, time, condition,

and their interactions on children's tendency to associate similarity and reality status beliefs. The final model revealed only a significant main effect of time ($\chi^2(1) = 4.04$, $p = .04$) and a significant main effect of condition ($\chi^2(2) = 11.44$, $p = .003$). This confirmed that average rates of associations differed across the three conditions and from day 1 to day 5.

To isolate the association between perceived similarity and reality status beliefs, it was necessary to assess differences between the conditions upon initial exposure (i.e., responses from day 1). Only the moderately dissimilar and highly dissimilar conditions were included in this analysis because children in the highly similar condition were at ceiling in their associations. Results from a logistic regression with age, condition, and their interaction predicting rates of association on day 1 revealed a non-significant main effect of age and a non-significant interaction. Thus, they were excluded from the final model in which condition was the only significant predictor ($\chi^2(1) = 6.55$, $p < .01$). Children in the highly dissimilar condition ($M = .36$, $SD = .49$) showed significantly lower rates of association than children in the moderately dissimilar ($M = .70$, $SD = .47$) conditions.

Binomial tests for all three conditions confirmed that rates of association were significantly greater than would be expected by chance both the highly similar ($p < .001$) and moderately dissimilar ($p < .05$) conditions but significantly lower than chance levels in the highly dissimilar condition ($p > .05$). Figure 1 illustrates the pattern of responses among children across all conditions. This shows that all children in the highly similar condition, who heard a possible, ordinary physical event said that the event was similar to the real world and the majority of these children also said that the novel character was real. Likewise, the majority of children in the moderately dissimilar agreed that the event was similar to the real world and that the character was real. Thus the high rates of

association in both the highly similar and moderately dissimilar conditions stem from positive, not negative, responses for both perceived similarity and reality status. Conversely, most children in the highly dissimilar condition failed to show this high level of association. Figure 1 reveals that the most common response children provided was to say that the novel character was real but that the event was not similar to the real world (36%).

Repeated Exposure

The next question of interest was how repeated exposure altered children's beliefs about perceived similarity and reality status judgements. Given the significant main effect of time reported by the mixed effect logistic regression (see above), there is some support for the hypothesis that repeated exposure did have an effect on the associations. To further assess this, a logistic regression of condition, age, and their interaction on associations from day 5 was conducted. Again, children from the highly similar condition were not included in this statistical test as they were at ceiling in their associations. Results revealed a non-significant effect of condition, age, and their interaction. That the effect of condition was no longer significant at day 5 supports the hypothesis that repeated exposure had an effect on children's responses. By day 5, rates of association were similar across both moderately and highly dissimilar conditions.

Binomial tests for the three conditions revealed that children in the highly similar ($M = .87$, $SD = .35$) and moderately dissimilar conditions ($M = .73$, $SD = .45$) provided significantly more associations than predicted by chance (both $ps < .05$) and that children in the highly dissimilar condition ($M=.61$, $SD=.50$) were now showing chance levels of associations. Figure 2, in comparison with Figure 1, demonstrates that in both the highly similar and moderately dissimilar conditions, children's responses remained consistent

over time (both ps > .05). Moreover, Figure 2 reveals an increase in the level of associations at day 5 among children in the highly dissimilar condition as compared to their associations on day 1. Interestingly, the distribution of Real and Not Real responses did not change from day 1 to day 5, rather the changes occurred in the distribution of similarity judgements. Of the 28 children in this condition, 7 children changed their responses on day 5. All 7 exhibited an increase in association rather than a decrease and all but 1 of the 7 changed their similarity judgement rather than their reality status judgement. Thus, as a result of repeated exposure, nearly half of the children who said that Mark was a real character also said that the event was similar (47%) (compared to 23% on day 1) and the majority of children who said that Mark was a fictional character also said that event was dissimilar (89%) (compared to 60% on day 1). This evidence suggests that familiarity increases children's tendency to associate perceived similarity and reality.

Discussion

The goal of the present study was to assess developmental differences in the relationship between perceived similarity and reality status beliefs, and to explore the effects of familiarity on their association. Although no age differences were found, results indicated that associations were high for ordinary events and improbable events but not for impossible events. Specifically, nearly all children in the highly similar and moderately dissimilar conditions reasoned that the event was similar and that Mark was a real character. This supports the prediction that children's beliefs about the similarity between a novel event and the real world are associated with and help guide initial beliefs about the reality status of the novel world. When faced with a novel world, children are able to evaluate its similarity to the real world and use these perceptions to decide

whether the novel world is real or fictional. Although one might be inclined to argue that children in this study were not making judgements about similarity but were instead answering the similarity questions based on their own personal experience with people riding two- and one-wheeled bikes, our data suggest that this is not the case insofar as many children denied having seen people ride such bikes but still agreed that people could do so. This is especially informative in the moderately dissimilar condition. In this condition, the majority of children expressed positive judgements of similarity as measured by the second similarity question, Q2. In fact, all but 3 children denied that things like riding a one-wheeled bike ever happen around them (Q1), instead they said that it could happen (Q2). Thus, children were not simply responding based on personal experience with people riding one wheeled bikes, rather they seemed to understand, and perhaps imagine, that it is at least possible to ride a one wheeled bike. This finding is important to highlight because it suggests that children do have some understanding that improbable events are possible, arguing against some previous research which suggests that children cannot distinguish improbable from impossible events (Shtulman & Carey, 2007; Woolley & Ghossainy, 2009).

Results from the highly dissimilar condition revealed that children do not reflect exclusively on a novel event's adherence to physical laws to determine reality status. Indeed, many children in the highly dissimilar condition who heard about an impossible event responded negatively to the perceived similarity questions but nevertheless asserted that Mark was a real character. Such dissimilar-but-real responses suggest that even when children admit that an impossible event is dissimilar to the real world, this does not necessitate that it be part of a fictional world. Nevertheless, although physical law similarity may not be a necessary condition for determining reality, it may still be sufficient. Evidence for this is reflected in children's responses to the highly similar and

moderately dissimilar narratives. The majority of these children answered that the events were similar and that Mark was a real boy. This evidence is only suggestive, and one might argue that physical law similarity is neither necessary nor sufficient on the basis that children in all three conditions were more likely to confer reality to Mark rather than non-reality.

Perhaps children believed Mark to be real because of the highly realistic picture of the boy that accompanied the story. This would correspond to an evaluation of perceptual similarity, a factor that was included in the broader framework of making similarity evaluations. Thus, although children in the highly dissimilar condition disagreed with the similarity of the physical event to the real world, they may have been considering the similarity of Mark to other boys in the real world and therefore concluded that he is real. This suggests that in some cases, perceptual similarity may have a stronger weight than physical law similarity in the overall similarity evaluation. Although the current procedure makes it difficult to assess the isolated effect of physical law similarity on reality status beliefs as was the intended purpose of this study, the data nevertheless provide preliminary support for the thesis that evaluations of similarity, including physical law and perceptual similarity, are associated with beliefs about reality. As mentioned earlier, the factors outlined are not presumed to work alone; rather, it is argued that they may have additive or interactive effects. To better unpack the relationship between physical law and perceptual similarity, a future study might manipulate the similarity of the pictorial representation for a set of similar and dissimilar physical events. For example, children might hear about a highly dissimilar event and see either a realistic representation, a cartoon, or no image at all. It would be predicted that children who were shown a cartoon or no image would be less likely to believe the novel character is real than children who were shown a realistic picture.

The findings support the prediction that repeated exposure affects the rates of association between perceived similarity and reality status. On day 1, there was a very low level of association among children in the highly dissimilar condition. By day 5, however, a subset of children came to show an association, either saying that the event was similar and the character was real or the event was dissimilar and the character fictional. Thus, repeated exposure seems to have increased children's tendency to associate similarity judgements and reality status beliefs. Unfortunately, it was impossible to evaluate the effect of familiarity for the other two conditions because those children already had high rates of association on day 1.

Nevertheless, it is interesting that repeated exposure resulted in some children expressing that an impossible event is similar to reality. Of the children who responded that the event was similar and Mark was real, all but 1 said that riding a bike with no wheels does not happen around them but could possibly happen. Thus, children were not being suggestible and simply believing that people around them ride bikes with no wheels, rather they seemed to become open to the possibility that it could happen. This is in line with the Piagetian view of children as learning about the world through the assimilation of novel information and accommodation of their own beliefs (Piaget, 1954). Although none of the children had ever experienced riding a bike without wheels nor had they seen someone ride such a bike, after repeatedly hearing about a child on a bike without wheels, they seem to have incorporated this novel information into their schema of possible physical events and thus changed their beliefs about how similar this is to the real world. This is illustrative of the flexibility of children's mental models of reality and their ability to continuously rework their schemas about how the physical (and potentially the social) world behaves.

An important follow up of this study would include a larger variety of dissimilar events in order to better assess the effects of repeated exposure. It would be important to explore the effect of familiarity on children's judgements of other moderately dissimilar events. Although children in this study provided high levels of association for the improbable event even on day 1, this might not apply to other improbable events. It is conceivable, and not unlikely, that more improbable events would elicit initial judgements similar to those seen for the impossible event and that repeated exposure will likewise increase children's tendency to associate similarity and reality. Indeed, our results contradict findings reported by Shtulman and Carey (2007) in that children in their study were strongly inclined to judge a range of improbable events as impossible. If we consider possibility and impossibility as a continuum with improbable events falling somewhere in between, it is possible that the events used by Shtulman and Carey (2007) fall closer to the end of impossibility than the event used in this study. Thus, a repetition of this study with a wider range of improbable events might provide the variability in initial judgements about similarity and reality status to confirm that familiarity increases children's associations between these two factors.

Condition	Number of Positive Similarity Judgements	Number of REAL Judgements	N
Highly Similar	On Q1: 29 On Q2: 1 **Total: 30**	26	30
Moderately Dissimilar	On Q1: 3 On Q2: 22 **Total: 25**	26	30
Highly Dissimilar	On Q1: 1 On Q2: 7 **Total: 8**	18	28

Table 1: Frequency of positive similarity judgements and REAL judgements on day 1.

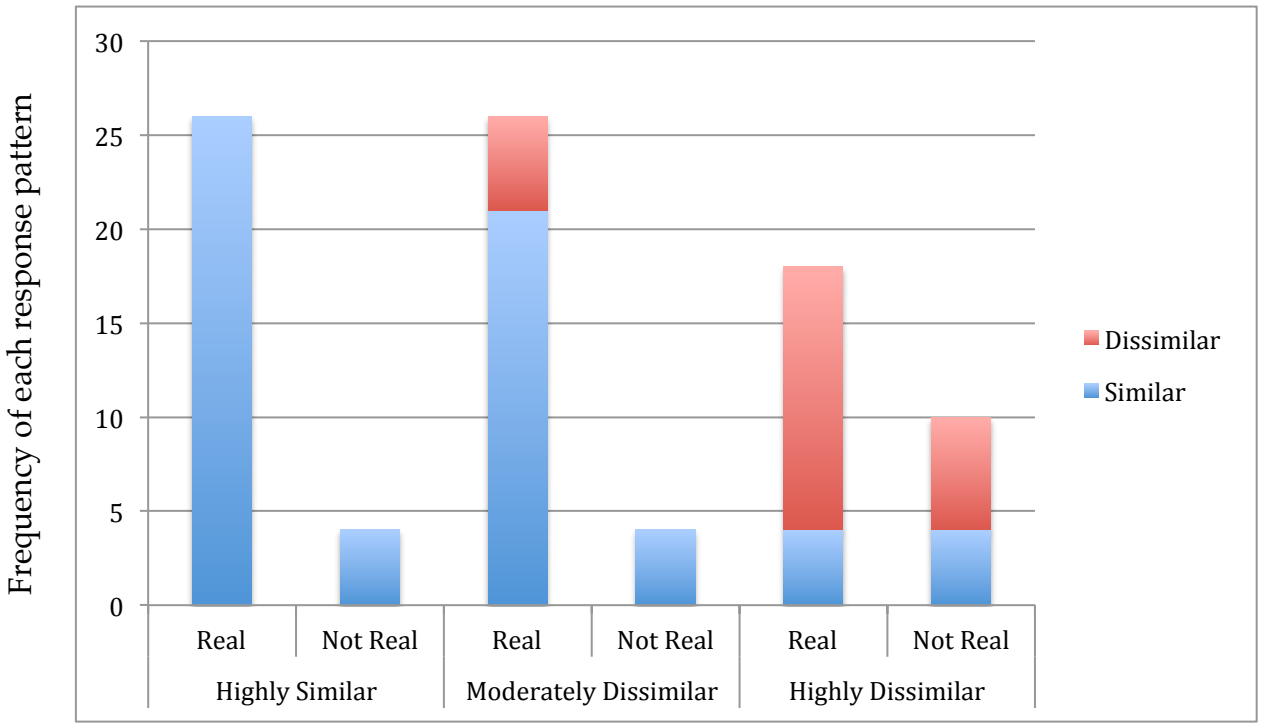

Figure 1: Frequency of each response pattern across conditions at day 1.

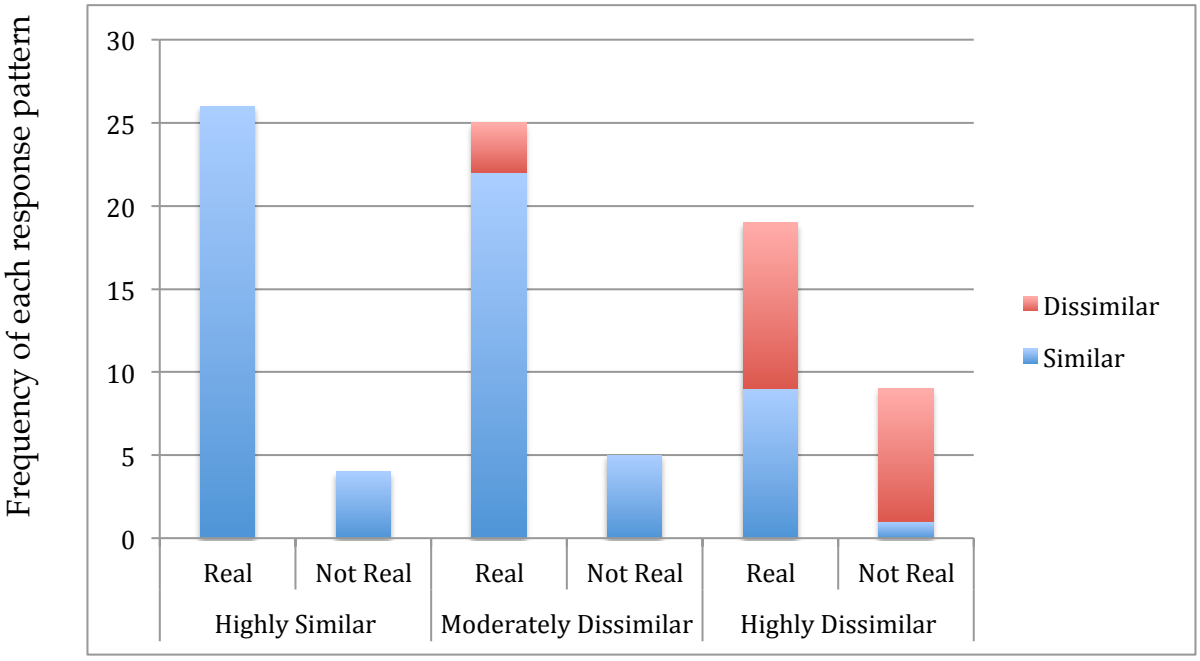

Figure 2: Frequency of each response pattern across conditions at day 5.

Appendix A: Response Form

Highly Similar

Today I'm going to tell you about a kid named Mark. Mark is five years old and he lives with his mom, his dad, and his sister Lucy. Mark loves to go for bike rides in the park near his house. He has a bike with two wheels on it, and on Saturday he uses it to go for bike rides with his dad.

Moderately Dissimilar

Today I'm going to tell you about a kid named Mark. Mark is five years old and he lives with his mom, his dad, and his sister Lucy. Mark loves to go for bike rides in the park near his house. He has a bike with one wheel on it, and on Saturday he uses it to go for bike rides with his dad.

Highly Dissimilar

Today I'm going to tell you about a kid named Mark. Mark is five years old and he lives with his mom, his dad, and his sister Lucy. Mark loves to go for bike rides in the park near his house. He has a bike with no wheels on it, and on Saturday he uses it to go for bike rides with his dad.

Interview Questions - Session 1

Q1) Tell me, do people around you have a bike with _____ in real life?

yes no

Q2) if no to Q1, ask: Do you think people could have a bike with _____ in real life?

yes no

Do you think that Mark is 5 years old or 10 years old?

5 10

Do you think that Mark lives in a big house or a small house?

big small

Q3) Do you think Mark is a real boy or is he just a pretend boy?

real pretend

Interview Questions Session 2:

Do you think that Mark wears a blue helmet or a green helmet when he goes on bike rides?

blue green

Do you think Mark rides his bike everyday or only sometimes?

everyday sometimes

Do you think that Mark needs to get a new bike or can he keep his old one?

new old

Do you think that Mark has a big bike or a small bike?

big small

Interview Questions Session 3:

Do you think that Mark likes to get on the swings in the park or does he like to get on the seesaw?

swing seesaw

Do you think that Mark rides his bike on the sidewalk or on the street?

sidewalk street

Do you think that Mark likes to eat carrots or apples during snack time?

carrots apples

Do you think that Mark rides his bike fast or slow?

fast slow

Interview Questions Session 4:

Do you think that Mark rides his bike during the daytime or at night?

daytime nighttime

Do you think that Mark has blue eyes or brown eyes?

blue brown

Do you think that Mark also likes to go swimming in the summer or does he only like to ride his bike?

swimming biking

Do you think that Mark is a tall boy or is he a short boy?

tall short

Interview Questions Session 5:

Q1) Tell me, do people around you have a bike with _____ in real life?

yes no

Q2) if no to Q1, ask :Do you think people could have a bike with _____ in real life?

yes no

Do you think that Mark is 5 years old or 10 years old?

5 10

Do you think that Mark lives in a big house or a small house?

big small

Q3) Do you think Mark is a real boy or is he just a pretend boy?

real pretend

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